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On the frequency of gynandromorphic spiders

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Four cases of lateral gynandromorphism in spiders are described (*Minyriolus pusillus*, *Tapinocyba pallens*, *Tapinocyba biscissa* and *Oedothorax retusus*, family Linyphiidae, subf. Micryphantinae). These gynandromorphs are derived from a collection of 69 970 adult spiders (*Tapinocyba paltens* 11600, *Minyriolus pusillus* 11 550). A rough estimate of the frequency of gynandromorphy is thus possible.

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1. Introduction

In a review "Spider gynandromorphs and intersexes" Kaston (1961) characterized these aberrations as "exceedingly rare." Twenty years earlier Holm (1941) mentioned that he had found only one gynandromorph in "a great material of spiders". Hackman (1952) also had seen only one specimen. For earlier summaries, see Bonnet 1934 and Rabaud & Millot 1933. I have not searched the more recent literature for further cases.

2. Material

In my collection, gynandromorphs (+ one intersex) are represented as follows (Fig. 1):

Tapinocyba pallens (O. P.-Cambridge). Lateral gynandromorph, near Tvärminne Zoological Station, Svanvik 28. IX. 63, spruce forest in *Hylocomium* (sample contains 6 ♂ 13 ♀). Left palp normal ♂, right typical ♀. The postocular slit on the left side normal, on the right only half the normal length. The epigyne shows a fairly normal right half, with ducts only slightly encroaching upon the empty left side.

Tapinocyba biscissa (O. P.-Cambridge). Lateral gynandromorph, Mäntyharju, Mäkelä 7.V.75, under a heap of decaying leaves in a meadow (sample containing 4♂ 2♀). Left palp normal, including the U-shaped tibial apophysis. Postocular slits almost absent. The female genitalia are developed only on the right side, but appear tilted to the left and cross the median line somewhat.

Minyriolus pusillus (Wider). Lateral gynandromorph, near Tvärminne Zoological Station 21.IV.62, pine forest in *Hylocomium*. A normal ♀ contained in the sample. The right palp is typically ♀, the left imperfectly ♂: The tibia is shorter than normal and ends bluntly (without any long, pointed apophysis). The paracymbium lacks an upturned part and is turned through 90° (along the cymbium). The subtegulum looks almost normal, with spermatotheca present, but the tegulum is abnormal and the spermal duct does not seem to enter it. The distal portions of the bulbus are apparently enclosed in a remnant of the cuticle of the subadult stage and are very incompletely developed (median apophysis and embolic parts). The cephalic part of the prosoma is only a little more raised than in normal females; there is no postocular pit. The female genitalia are developed only on the right side, but are not clearly distinguishable.

Oedothorax retusus (Westring). Not a typical lateral gynandromorph, Enontekiö, Siilasjärvi 27. VI. 62, shore among leaves. Sample containing 12 ♀, Bo Forsskåhl leg. Both palps display ♂ features, but in a rudimentary fashion, especially to the right. The tibia of the left palp is longer than in the normal ♂, but has a small dentiform distal apophysis at the ventral edge. The paracymbium has remained completely attached to the margin of the cymbium and is very small. The bulbal parts are not readily identifiable. The subtegulum and tegulum are not differentiated and contain no traces of a spermal duct system; the two distal parts probably represent a radical and an embolic part. In the prosoma no ♂ features can be identified. The female genitalia display a very beautiful right-sided unilaterality.

Meta segmentata (Clerck). Intersexual specimen, Tvärminne Zoological Station 5.IX.63 (sample contains 1 ♂ 1 ♀). The right palp is normal; the left bulbus + cymbium are unfortunately lost. The female genitalia are quite symmetrical, but very weakly developed; this applies to both the epigyne and the receptacula. It seems very possible that intersexual spiders with such indistinct features have been overlooked. The sorting and determination of very large samples from different habitats often has to be carried out in a great hurry.

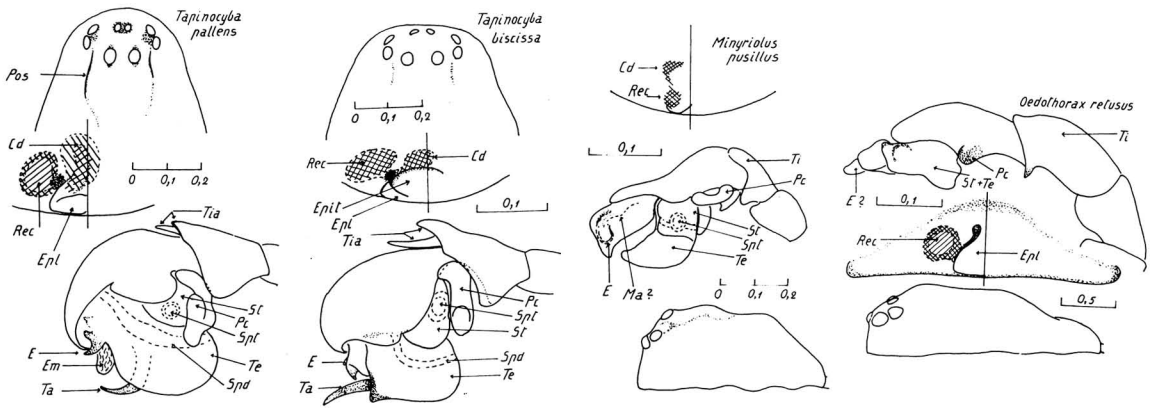

Fig. 1. *Tapinocyba pallens*: Cephalic part of prosoma from above, female genital parts, left palp in lateral view. *Tapinocyba biscissa*: Cephalic part of prosoma from above, female genital parts, left palp in lateral view. *Minyriolus pusillus*: Female genital parts, left palp in lateral view, prosoma from left. *Oedothorax retusus*: Left palp in lateral view, female genital parts, prosoma from left. — *Cd* Copulatory ducts. — *E* Embolus. — *Em* Embolic membrane. — *Epit* Epigynal pit. — *Epl* Epigynal plate. — *Ma* Median apophysis. — *Pc* Paracymbium. — *Pos* Postocular slit. — *R* Radical part. — *Rec* Receptaculum. — *Spd* Spermatic duct. — *Spt* Spermatheca. — *St* Subtegulum. — *Ta* Terminal apophysis. — *Te* Tegulum. — *Ti* Tibia. — *Tia* Tibial apophysis. Scales in mm.

3. Discussion

As my studies aimed at an exact analysis of the spider communities of different habitats and their phenology, all my samples have been recorded on cards with information about numbers of adult males, adult females and juveniles. It is thus possible to relate the sexual abnormalities enumerated above to a known number of spiders.

My total catch includes 69 970 adult spiders. There is thus one gynandromorph per 17 000 normal spiders. When the collections of the Zoological Museum, Helsinki University, are added to my own samples of species containing gynandromorphs, we get the following numbers of adult specimens: *Tapinocyba pallens* 11 616, *Tapinocyba biscissa* 50, *Minyriolus pusillus* 11 553, *Oedothorax retusus* 772. (The adults of *Meta segmentata* in the two collections total 1095.) To this material we can add the laterally gynandromorphic *Troxochrus scabriculus* (Westring) described by Hackman (1952). My own collection and the collections of the Zoological Museum (including Hackman's samples) comprise 684 adults of this species.

The samples do not, of course, allow an exact estimation of the frequency with which gynandromorphs appear in nature; something like 1/10 000—1/20 000 seems, however, a reasonable estimate. Kaston (1961) compared his characterization "exceedingly rare" with the generally accepted frequency of one gynandromorph per 2 000—3 000 *Drosophila melanogaster* flies hatched. Even if gynandromorphs are assumed to be less viable than normal spiders and thus to appear in nature at a lower frequency than at hatching, the probability of a gynandromorphic spider being generated is evidently very low. The majority of spiders have two different X chromosomes (♀ $2X_1$ $2X_2$, ♂ $1X_1$ $1X_2$) (Hackman 1948). Lagging and subsequent elimination of the female-determining X chromosome in the first cleavage division is postulated as the cause of lateral gynandromorphism in *Drosophila* with a probability of 1/2 000—1/3 000. The same mechanism would, of course, yield spider gynandromorphs with a probability of one in several millions, if the two X chromosomes are supposed to be eliminated with a probability of the same order of magnitude as in *Drosophila* and independently of each other. But it is conceivable that under special cytological conditions the X chromosomes act as if they were more or less closely linked.

Hackman (1952) suggested as a possible mechanism that the egg cell and the polar body are fertilized with sperms of different types (male-determining and female-determining), the polar body then giving rise to one half of the

spider (instead of the first cleavage cells forming the origin of the right and left halves). I have not seen any estimations of the probability of such an event.

It seems noteworthy that a disproportionately great number of gynandromorphs has been described in the genus *Oedothorax*, as already pointed out by Holm (1941).

References

Bonnet, P. 1934: Le gynandromorphisms chez les Araignées. — Bull. Biol. France Belgique 58: 167—187.

Hackman, W. 1948: Chromosomenstudien an Araneen, mit besonderer Berücksichtigung der Geschlechtschromosomen. — Acta Zool. Fennica 54:1—101.

—»— 1952: A gynandromorph of the spider *Troxochrus scabriculus* Westring. — Memoranda Soc. Fauna Flora Fennica 27:67—69.

Holm, Å. 1941: Ueber Gynandromorphism und Intersexualität bei den Spinnen. — Zool. Bidrag Uppsala 20:397—413.

Kaston, B. J. 1961: Spider gynandromorphs and intersexes. — J. N. Y. Entomol. Soc. 69: 177—190.

Rabaud, E. & Millot, J. 1933: Anomalies sexuelles chez les araignées. — Arch. Zool. Exp. Gen. 75: 267—281.

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